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ABSTRACT

After a discussion of the confused terminology, overlapping categories, and ambiguity evident in categorization of comprehension questions in current reading series and in the literature on comprehension, a comprehensive classification scheme is proposed that seeks to avoid these problems. The proposed classification scheme has three orthogonal dimensions: The first specifies the size of the linguistic units that must be manipulated in order to solve the task (concepts, propositions, or larger units). The second specifies the type of logical relation that obtains between the linguistic units, and the third, the extent to which the text provides an explicit answer to the question. Six types of logical relation have been delineated for the second dimension: superordination, subordination, coordination, asking for an attribute of a concept, asking for a concept related to an attribute, and case-grammatic relations. The advantages and disadvantages of the proposed scheme are also discussed. (AA)

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ISSUES IN RESEARCH ON READING COMPREHENSION

Operationalizing terms and definitions in reading comprehension

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Pick up any two reading methods texts. Turn to the comprehension chapter of each. Now compare them. Add a third or a fourth text to your experiment. Does it appear that one writer's oranges are another writer's apples? You'll find some overlap. But you'll also find conflicting terminology and conflicting scope and sequence charts. Now replicate the experiment with two or three sets of developmental reading series. Again conflict arises. One series will start right off in first grade suggesting that teachers ask a range of comprehension questions from literal recall of details to critical thinking questions. A second will use only literal recall questions in grade one, reserving higher order questions for later years. A third will direct the teacher not to worry about comprehension at all until second or third grade.

How can this state of affairs exist? Is the topic so elusive that it defies accurate description? Do we know so little about the comprehension process that one writer's opinion will serve as well as any other writer's opinion? Are we all using different words to describe the same underlying process?

We suspect the latter explanation is most accurate. We know there is a natural human (and especially professional) tendency to inject uniqueness into our own creations. If someone else has a skill called, "grasping the main idea," we may choose to call it, "identifying the central thought." Faced with 17 other texts which list a skill called "drawing conclusions," the label, "drawing inferences," may seem attractive to us. So the first source of confusion in reading comprehension stems from the fact that a given skill may exist under a variety of labels from one source to another.

A second source of confusion can be found within a single account of comprehension skills rather than between one account and another. Quite often a given taxonomy will exhibit internal redundancy. For example, McCanne (1963) lists each of these skills as separate entities:

1. Classifying things
2. Classifying things and ideas
3. Recognizing wholes and parts
4. Finding details to support main ideas
5. Recalling information for objectives
6. Suggesting a title for a story
7. Deciding on subtitles
8. Finding the main idea of a story
9. Finding the main idea of a paragraph
10. Finding major thought units

Granted, there are some differences among these tasks. Yet a common thread runs through all of them: Relating more general ideas to more specific ideas. Furthermore, skills 6-10 differ only in the size of the linguistic unit which must be searched in order to complete the task. There is an inherent problem with lists: Because each skill is listed separately, a list leaves the impression that each skill has a separate and equal identity when, in fact, they are either highly interrelated or different names for the same thing. As long as we persist in making long lists of comprehension skills, that separate but equal illusion will persist in confusing us.

A third source of confusion stems from the fact that some skills that get classified as a comprehension skill in one system are labelled as word identification skills in another. Ironically, this mismatch pleases us because it serves to support our underlying conviction that any attempt to

separate the reading process into little compartments is, at best, an arbitrary convenience allowing us to talk about one thing at a time.

For example, where should one include structural analysis - the study of root words, prefixes, suffixes and inflectional endings? Are they part of word identification or comprehension? Clearly, readers can use knowledge of morphemes (parts of words that carry meaning) to aid them in achieving the correct pronunciation of a word. But those same readers can use that same morphemic knowledge to help them decide upon the meaning of a word. Consider contextual analysis. Even the most avid phonic-oriented writers concede that - at some point - readers use knowledge of context to aid in the word identification process. But should we consider the ability to utilize contextual information a comprehension or a word-identification skill?

A fourth source of confusion in the comprehension literature centers on the rather loose distinction often offered between comprehension as a product and comprehension as a process.

Comprehension as process is an elusive entity. It is what happens to readers as they read. It is what keeps them going when they read. It involves the intuitive comment, "Oh, sure! That makes sense to me." It is what has broken down when we say to ourselves, "It's all Greek to me," or "I can't take it any longer"; or when we find that we have just skimmed our eyes over two pages and realize that we haven't understood one iota of those two pages.

Comprehension as product is not so elusive. On the other hand, we wonder about its reliability. Comprehension as product involves measuring, in some more or less objective way, the net result of the process. Typically it involves evaluating responses to specific questions we may have asked our readers. Comprehension as product is what we asses by means of the dazzling array of tests we give to children. It is what we assess when we ask our readers, "Tell me what you remember about (got out of, thought about, learned in)

that story." It is what we get when we ask for an outline or a summary of a passage. Now, most of us would like to think that we can draw inferences about the processes children must have used on the basis of the products they provide us with. Whether or not such inferences are legitimate is an unsettled issue. However, when we get down to the bottom line, most of us would probably agree that processes are either totally or mostly inaccessible. Hence we are stuck with products as our usual means of evaluating the quality and quantity of students' comprehension.

A fifth problem in reading comprehension centers in the distinction between literal and inferential comprehension. Depending upon how people choose to define these terms, one's writer's literal comprehension task will be another's inferential task. An example will help to illustrate the point.

> John went to Vescio's, his favorite Italian restaurant. He ordered lasagna. When the waiter brought it, John was so enraged that he left without leaving a tip. He even forgot his umbrella.

(1) Where did John go?
(2) What did he order?
(3) Why did John fail to leave a tip?
(4) Why did John forget his umbrella?
(5) Why did John go to Vescio's?
(6) Who seated John at his table?

Most would agree that questions (1) and (2) a literal comprehension and that (6) tops inferential comprehension. But questions (3), (4) and (5) are fuzzy. Some would argue that all <u>why</u> questions require inferences. Yet, the answer to (3) is clearly stated and clearly related to the segment from which question (3) was generated. Others would argue that since the answers to all three are in the text, they all represent literal comprehension. The problem with such a contention is that it is not obvious, at least in terms of specific grammatical or propositional relations, that <u>he left his umbrella because he was so angry</u> or that <u>he went to Vescio's because he wanted to</u>

eat (lasagna). In point of fact, there may have been numerous motivations for his going to Vescio's. Later, we will propose a rather strict definition of literal (we will call it explicit) comprehension, one that requires a precise grammatical relation to obtain between question and answer in order to be classified as literal (explicit) comprehension.

In the conduct of research, one should not gloss over the importance of such distinctions and the different conceptualizations researchers bring to their experiments. Referring back to our examples, if a researcher wanted to contrast literal versus inferential comprehension, he or she might draw quite different conclusions about relationships depending upon how questions (3), (4) and (5) were classified.

At the very least what is called for in any comprehension studies are very explicit definitions of the types of comprehension measured, along with examples of the text and the probes used to assess comprehension.

A sixth problem in comprehension is related to the second problem we introduced. Just how many different comprehension skills, tasks, processes or components (whatever you call them) are there? Our reason, we well as some of our research (e.g., Davis, 1945 or Spearritt, 1972), would tell us that there is more than one component of comprehension but that there probably are not as many as some instructional programs would lead us to believe (occasionally upwards of 50 to 60 separate skills).

What we believe is needed is a comprehensive taxonomy of comprehension - one that captures the interrelatedness of so many seemingly separate skills but that allows us to measure, analyze and discuss specific facets of a particular cluster when it seems appropriate to do so. The remainder of this paper proposes such a classification scheme.

Comprehensive Comprehension Clusters

The proposed comprehension classification scheme is best modeled by a three dimensional cube. The first dimension (our rows) specifies the size of the linguistic units that must be manipulated in order to solve the task: a concept (usually expressed as a word), a proposition (expressed as a clause or sentence), and larger units (expressed as paragraphs or passages).

The second dimension (our columns), specifies the type of logical relation that obtains between the linguistic unit. At present there are six relations, but we are not satisfied that this dimension is complete.

The first relation is superordinate (given a class label, can one find a member of that class of things, e.g., dog ⇒ collie). We use the mnemonic, Ruleg (rule to example), borrowing a term from programmed instruction.

The second relationship is subordinate (given an example of a class of things, can one find a class to which it belongs, e.g., collie ⇒ dog).

The third relation is co-ordinate (given a member of a class of things, can one find another member, e.g., collie ⇒ spaniel (two dogs) or dog ⇒ cat, (two mammals or pets)). This relation also accounts for alleged synonomy (crate ⇒ box). The mnemonic can be either Eg eg or Rule rule, which turn out to be synonomous.

The fourth relation we call attributional, characterizing the fact that at times we give a concept as a stimulus and ask for an attribute as a response, e.g., dog ⇒ bark. The mnemonic is Rulatt.

The fifth relation is the inverse of four; that is we can give an attribute and ask for the concept to which it is related, e.g., bark ⇒ dog. Not surprisingly it is called Attrule.

The sixth category-case grammatic relations-hides a multitude of sins and, in a minor sense, undermines, the precision and clarity of the scheme. Basically its role is to account for the typical range of wh-type questions that pervade reading comprehension activities.

The presence of category six introduces ambiguity into the system, however. For example, a why question like, Why did John go downtown?, to be answered after having read, John went downtown because he needed to buy a new bike, appears in the concept level cell of case-grammatic relations. Yet the Ruleg or Egrule column could contain "causes" at either the passage or propositional level if they were examples of a class of causes, e.g. causes of the Civil War.

A trade off is possible between the case grammatic column and the two attribute columns. That is, if one will allow an event to be called a rule, then events can have attributes like location, manner, time, cause, effect, etc. Then, many of the relations currently in the Case Grammatic column would fall into the Rulatt column, leaving possibly only the who and what question types. The case grammatic column could be eliminated entirely if one allows the verb of any sentence to be considered a concept that can have attributes like agent, instrument, object, manner, time, location, cause, effect. However the upshot of either of these changes is to transform a fairly clean column like Rulatt or Attrule from a fairly clean into a messy category.

Some clarity can be acheived if the Case Grammatic column is expanded into separate columns, one for each case relation; however that clarity is achieved at the price of parsimony: The scheme is no longer economical.

The problems encountered by introducing this sixth category are obvious; yet we think such relations must be introduced somewhere in the framework. The

question that remains is when and how. Further logical analysis is one possibility, and we have sketched out some ways that might be achieved. A second possibility is to take an empirical route; that is, to what other columns are these relations most related, either individually or as a group.

Now two dimensions: size of the linguistic unit to be related and type of relationship have been specified. The face of the taxonomy is complete. Our claim is that we can take any comprehension task, be it cloze, questions, workbook activities, suggestions out of a basal reader, and unambiguously classify it in one of the cells of the matrix. What would be the point of such an activity? We believe that it would allow us to compare presently incomparable data from different comprehension experiments. Second, we could similarly taxonomize the activities in a reading program in some independent fashion, allowing comparisons between or among programs. Third, we feel such a taxonomy captures the essential interrelatedness of seemingly disparate comprehension tasks. Finding main ideas, categorizing concepts, summarizing a passage, and completing an outline do share a common thread: locating more general, more abstract labels for more specific, more concrete linguistic entities. We would like teachers and researchers to recognize, and hopefully, empirically validate such interrelatedness

Textual explicitness

Notice that the model depicted in figure 1 contains a third unspecified dimension. It is unspecified because we have been unable to decide whether or not our third dimension is real. We call it textual explicitness, but we are not certain that it has any function, except in certain very specific reading/study situations.

For example, suppose a reader reads the sentence,

All crows like to eat corn.

and immediately answers the question,

What do all crows like to eat?

This case grammatic relation (column six) is stated explicitly, and most of us would call such comprehension literal. But what if the reader reads that sentence on Monday and is asked the question on Tuesday, without reference to the text? Is it still literal comprehension? It certainly is factual; but with such an interlude between initial reading and response, how does it differ from any other factual question we might ask without the benefit of access to the text. Furthermore, most readers probably knew that fact already.

Now suppose the reader reads,

Corn farmers like to keep all crows out of their cornfields.

and is asked to answer,

What do all crows like to eat?

Now the answer must come by inference from the sentence or directly from a store of prior knowledge. Is comprehension literal at this point? Does it make any difference if the question is asked immediately after reading or a day later? Does it matter whether or not the reader can look back at the passage in order to answer the question? Suppose a reader doesn't know that crows like to eat corn. If and when she or he stores the sentence about corn farmers, does she or he infer the fact that crows like to eat corn and store it along with the farmer sentence? Or does she or he store the farmer sentence, and infer crow's gastronomic preferences only when asked the question?

Furthermore, how can listening comprehension ever be compared to reading comprehension if we consider access to the textual message an important criterion in deciding whether or not the message is explicit (or the task requires literal comprehension).

The point is that if comprehension is assessed at some point where short term memory no longer operates and without access to the text, we do not know how to distinguish between literal and inferential comprehension. We know of no way of distinguishing between what was in the head prior to the reading and what is in the head after reading the passage. Granted we can give a comprehension test before and after the reading of the passage and get some measure of information gain, but we suspect that such a metric will not capture the subtle influences of prior knowledge on text comprehension and text comprehension on knowledge store.

This brings us to the basic point about the literal/inferential issue: while we do not think we can assess literal versus inferential comprehension, we do think we can assess the influence of the explicitness with which certain relations are stated; that is, we think that explicitness may make a difference with regard to whether or not a particular relation gets into our memory store at all. Hence it should emerge as having an effect on the comprehension metrics we use.

Were we to use it as a third factor, we would include three levels varying in terms of textual explicitness. Those levels are exemplified in Figure 2.

Conclusion

What are the advantages of a scheme such as the one we have proposed?

1. Comprehensiveness: the claim is that we can classify (and usually unambiguously) all but an insignificant number of comprehension tasks one might find in a test, a workbook or experimental materials.

2. Independence and Orthogonality: again, with a few exceptions, the dimensions (linguistic unit, relation and textual explicitness) are well defined in an independent way. We are not certain that all the cells will fill up.

But certainly those on the face (which is probably explicit) do. This is to be contrasted with taxonomies that change definitional criteria without telling you so.

3. Intuitive Interrelatedness: it captures the intuitive perception that what goes into a particular row or particular column are somehow more similar than any of the cells would be to a cell in another row/column combination. In this regard it would be interesting to experimentally validate the cohesiveness of rows and columns through some factor analytic technique.

4. Utility: such a scheme ought to be useful in comparing present by incomparable research studies in reading; that is, regardless of what the skills are called, we ought to be able to determine what kind of task was utilized by classifying it according to the three dimensions. Similar comparisons between reading programs are also possible.

Now the problems and disadvantages:

1. Ambiguity: as indicated earlier, column six introduces ambiguity into the system. But the cost of omitting it is too great. If column six functions are moved into other cells, the clarity of those other cells is lost. If column six is stretched out over four or five other columns, economy is lost. In short, there is a hornet's nest in the system, and the question is, where do you want the hornets to live?

2. Substantive Equivalence: as we were putting this scheme together, we encountered two articles (one by Meyer (1976) and one by Frederiksen (1977) which made us question whether or not we were doing anything different from what they were doing by employing a case grammar framework for propositional analysis and propositional relations. We do not know those systems well enough to fully evaluate the substantive equivalence between our system and theirs.

We suspect that there are some differences, especially in rows 2 and 3 and in depth dimension (textual explicitness). As the creators of the present taxonomy, we would not be disappointed if someone could persuade us that our entire scheme could be recast in case relations.

	A is a class to which B belongs	A is an example of B	A (is about the same as) (parallels) B
	1. RULEG	2. EGRULE	3. EGEG or RULERULE
CONCEPTS	Find all the animals tree dog cow red house hit	dogs, cats and pigs are all 1. animals 2. plants 3. canines 4. paws	Which word belongs? dog cat pig 1. banana 2. horse A synonym for 3. plant big is _____ 4. wolf
PROPOSITIONS	What three things did the crew do to clean up the ship?	-The main idea of this paragraph is . . . -The fact that cars rust only goes to prove that . . . -A good title for this paragraph is . . .	-Find a paraphrase for this sentence: -A more colorful way of saying, Tom runs fast is... Tom is a veritable gazelle.
PASSAGES	According to the article, what were the major causes of the Civil War? Below you will find an outline of the chapter. The major readings have been filled in from the list at the bottom complete the outline.	-A good title for this selection might be . . . -This section of the article describes . . . -Make an outline of the major points in the chapter!	-Tell me everything you can remember about this story. -What story does this remind you of?

Figure 1. Face of the Matrix

A Typically {does has is} B	A is an attribute of B	A is case related to B
4. RULATT	5. ATTRULE	6.
Which words go with dog? -bark -meow -bone -snout Do dogs meow?	bark → pig monkey dog Bark, bone, bite make you think of . . .	*Who? *What? *Where? How? *When? } Within a sentence Fill in the blanks
-What makes the American political process distinct from European systems? -How is the American political process similar to its European antecedents?	Election of a president by an electoral college characterizes what political system? Which sentence does not belong?	Why? (Within & Between) *Where? How? *What? *When? *Who? Under what condition? Between Sentences
-How is this story similar to (different from) the one we read last week about robins?	-Doughboys, Lafayette, Escadrille, Enfields are all associated with which World War?	
*In what part of the United States was the Civil War fought? *When was World War I fought?	*Which World War produced the largest number of casualties *Which World War was fought from 1914-1918?	

Figure 1. Face of the Matrix

TASK

What is the main idea of this passage?	Watermellons, apples, oranges, and tomatoes are all _____	Why did John go downtown?
Textually Explicit		
The main point of this passage is that birds build nests near their major food source. As an example, robins, birds that eat insects and worms, build nests in trees near grassy areas where there are likely to be many such morsels. Pheasants, birds that rely on wild grains, build their nests in marshy grassland areas.	Person has just read a segment including the sentence Watermelons, apples, oranges, and tomatoes are all fruits. Celery, onions, and radishes are vegetables.	John was getting ready to go fishing. First he went downtown because he had to buy some new lures, weights, and line. Then he got in his car and headed toward Bass Lake.
relation is implicit		
Birds build nests near their major food source. Robins, birds that eat insects and worms, build nests in trees near grassy areas where there are likely to be many such morsels. Pheasants, birds that rely on wild grains, build their nests in marshy grassland areas.	Some foods we eat are all vegetables. Others are fruits. What would you call watermelons, apples, oranges, and tomatoes? What would you call celery, onions, and radishes?	John was getting ready to go fishing. First he went downtown. He had to buy some new lures, weights, and line. Then he got in his car and headed toward Bass Lake.
In the text		
Robins, birds that eat insects and worms, build their nests in trees near grassy areas where there are likely to be many such morsels. Pheasants, birds that rely on wild grains, build their nests in marshy grassland areas.	No text available.	John was getting ready to go fishing. First he went downtown. Then he got in his car and headed toward Bass Lake.

Figure 2. Levels of explicitness for three selected skills

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